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WHAT'S NEW IN ASTRONAUTICS

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WHAT'S NEW IN AERONAUTICS

Target of the Second Step — the Moon

The start of the second step in conquering the universe was the launching of additional Soviet satellites, Kosmos I, II and III. A brief announcement of the program of research by means of a series of satellites which have been launched just this year shows that in a short time the necessary material was assembled to determine the regularities of the effect of active radiation on the living body, including further information directly connected with long-term flights in the universe. In the next three years, there will be a minimum of solar activity, which has a vital effect on the intensity of active radiation. It will be a suitable time for carrying out long term flights, first of all to the moon.

The scientific missions of the satellites are varied and include a very large program. Already the first two satellites are flying on a very elongated orbit (a maximum of 1560 kilometers and a minimum of 213 kilometers). The elongation of the orbit is determined by the mission which the satellites must perform. They are making many detailed measurements in the regions of high atmosphere and in zones of active radiation. The satellites therefore must fly the separate layers alternately. The information obtained from satellites with different orbits will give us a survey picture of the distribution of zones of active radiation around the earth. Among the further experiments which will be verified on the satellites are tests of new materials, their resistance to radiation, abrasion by cosmic dusts, etc. Likewise, the installation of various design elements on the satellites contributes to the future projection of large cosmic vessels. It probably is a matter of testing special plastics, for example, laminates of silicon fibers,

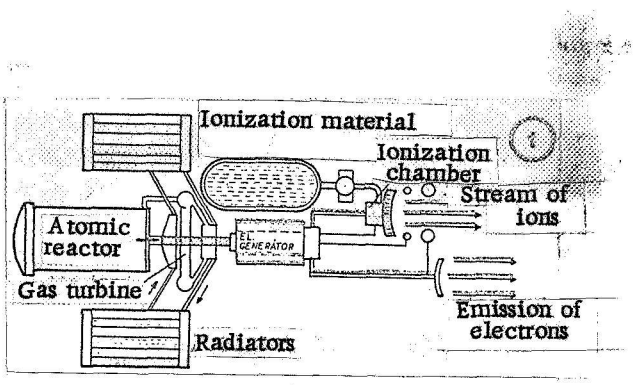

Figure 1 — Schematic drawing of an ionic motor.

which resist temperatures up to 3000°C. They can be used for the construction of the nose parts of rockets or cosmic vessels, as the thermal insulation of the combustion chambers and for other parts. Ceramic-metal mix-

tures have been used, for example, 72% chromium and 28% aluminum oxide. This mixture resists heat and abrasion very well, like zirconium and silicon carbides or zirconium borite. The tests will be the basis for their practical use in construction instead of previously used special steels, which are not completely satisfactory.

Reliable radio communications with the earth at a great distance is solved in principle at the present state of radio engineering and microelectronics. It is true there are strong disturbances of cosmic origin, as was the case in the cosmic laboratory sent in the direction of Venus, where for a very long time, radio communications were completely inoperative. The phenomena which cause these difficulties have not yet been precisely explained. Therefore it is necessary to acquire the necessary information about concentrations of charged particles in the ionosphere, which have a substantial influence on the propagation of radio waves. Also connected with this is study of the short-wave radiation of the sun and other cosmic bodies, which also is in the program of these satellites.

No less difficult is research on increase in the discharge of propulsive particles for the starting of rockets and for an interplanetary drive. The most thorough investigation in this direction is that of the so-called ionic motor, which will probably be the ideal drive unit for the movement of interplanetary vessels. These motors have already been laboratory tested in the Soviet Union, and in so doing many problems connected with the proper construction of these motors for rockets have been solved.

The principle of action of an ionic motor is the acceleration of electrically charged particles of matter -- positive ions -- with an electric field. We present a schematic diagram of an ionic motor in Figure 1, where the electric energy is obtained by nuclear reaction, with the use of a small reactor, the heat of which is converted into steam which, through a turbine, drives a generator which supplies a voltage of 5 amperes and 25,000 volts. In a reservoir, we have an ionization substance which we introduce into an ionization chamber. Alkaline metals, rubidium and cesium, which require the least energy for ionization, are the most suitable for use. The ions formed are accelerated by a high-voltage electric field, on the order of 10,000 volts. Thus they attain a great velocity, the amount of which depends on the voltage of the field and the atomic weight of the ions. They can attain a velocity of over 300 kilometers per second. The positive ions flying out of the motor are "neutralized" electrons.

The main problem of these ionic motors is assuring the necessary electric energy. Likewise, the removal of heat must be solved by radiation to the environment by means of suitable radiators. The ionic motor is characterized by a long-term operation, but it has a low amount of traction. Therefore, it is not suitable for starting of future cosmic rockets. Liquid fuel motors will serve only for the start and to put such motors in regions of less gravitation, which ionic motors could not reach with their low traction. Ionic motors then can solve the shipment of scientific apparatus to distant planets and their return to earth. According to the very brief statement of Soviet scientists, this research is expected in the next three or

four years.

We know the detailed program of the Communist Party of the Soviet Union for twenty years ahead. Plans for investigation of the universe are expressed in a very brief sentence, which however says a great deal: "It is a matter of honor of Soviet scientists to obtain for Soviet science first place in the most important scientific areas and to occupy thus a leading position in world knowledge in all fundamental directions." This conceivably includes cosmonautics, in which the leading position of the USSR has already been obtained. Soviet scientists and technicians are endeavoring first of all to send rockets with a human crew toward the moon and ultimately solve landing on the moon's surface.

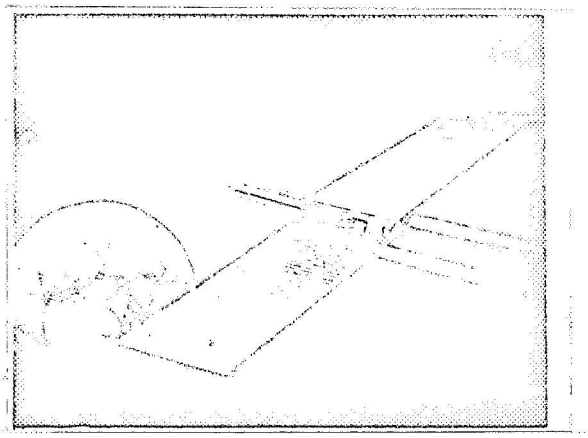

Figure 2 — Plan of an ionic rocket of the future. The large surfaces of radiators for the emission of heat are clearly shown.

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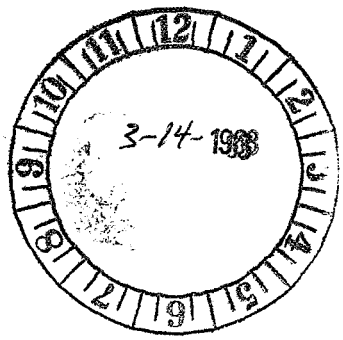
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